

# **Permanent Deformation Behavior of NAPTF Base and Subbase Courses**

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## **Abstract**

Rutting is the repeated load-induced permanent deformation of a flexible pavement. For unbound aggregate bases and subgrade soils that constitute the pavement foundation geomaterials, rutting is the only failure mechanism of relevance as no bound layers are involved. Depending on the large magnitude and dynamic nature of applied aircraft wheel loads and the relative strength of the pavement layers, a significant portion of the total permanent deformations can occur in the unbound granular layers, as was recently observed in the test sections of the FAA's National Airport Pavement Test Facility in Atlantic City, New Jersey. Knowledge is required of the relative contribution of these granular layers to the total permanent deformation of the airport pavement structure.

In this research project undertaken at the FAA's Center of Excellence for Airport Technology established at the University of Illinois, the NAPTF granular base and subbase aggregate materials have been tested in the laboratory subjected to various airport pavement stress levels, applied stress ratios, and loading stress paths. Special considerations are given to the magnitude of the heavy aircraft wheel loads and the stress path loading effects induced by the actual moving wheel loads of the Boeing 777 and 747 aircraft. Note that permanent deformations do accumulate at a higher rate under moving wheel loads than static loading. As such, a newly proposed laboratory test procedure taking into account the moving wheel load effects and the associated mathematical models developed are intended to realistically assess the rutting potential of airport pavement granular layers subjected to heavier, next generation aircraft.